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## COMPARATIVE VALUE OF MATURE SOWS AND GILTS FOR PRODUCING MARKET HOGS<sup>1</sup>

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### INTRODUCTION

There is wide variation in the practices followed by hog producers with reference to the ages of the breeding animals used in their herds. Some hog raisers use gilts almost exclusively, whereas others depend largely on mature sows. Most farmers use both mature sows and gilts to produce their pigs, but the proportion of each class varies greatly from farm to farm. Many hog raisers follow no definite plan in maintaining their herds of breeding sows, and there may be wide variation in the proportion of sows and gilts on the same farm from year to year.

Some farmers who have adopted the practice of using only gilts breed these animals to farrow their first and only litter when they are approximately 1 year of age. When the litters are weaned, the gilts are fattened and marketed. The gilts needed to produce the pig crop the following year are selected in the fall from the spring pigs then on hand. Pork producers following this program usually obtain a boar pig each fall, and he is disposed of after the close of the breeding season. Some farmers who raise fall litters breed the young sows to produce a second litter in the fall and then market them.

A farmer usually is able to determine with a considerable degree of accuracy whether or not a group of pigs in the fattening lot is making satisfactory gains. However, appraisal of the efficiency of his breeding animals is a much more difficult matter. Most farmers are not equipped to keep their breeding animals separate from one another or from other pigs, or to keep sufficiently complete records to be able to form a definite conclusion as to the relative value of mature sows and gilts for producing pork. Then, also, the variation in results from year to year due to factors other than the ability of the sows or

<sup>1</sup> This study was made in cooperation with the Montana Agricultural Experiment Station.

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gilts to produce profitable litters (such as weather, and presence of diseases or parasites) makes it desirable to have information available over a considerable number of years before definite conclusions are reached.

The continued exclusive use of gilts has raised vital questions in connection with such a practice. For instance, is there any tendency toward reduced vitality by the use, year after year, of successive generations of immature breeding animals? Does such a procedure result in any change in the size or type of the breeding animals used or in the quality of the pigs when finished for market? Any effect of such a practice on size of litters; on rate of growth of the pigs during the suckling period, so largely controlled by the quantity of milk furnished by the dam; or on the economy of gains made by the pigs in the fattening lots, would be of great importance.

To answer some of the questions relative to the use of mature sows or gilts, the Department carried on a series of experiments dealing with this problem from 1925 to 1932, inclusive. The work was begun at the United States Belle Fourche Field Station at Newell, S. Dak., which is maintained by the Bureau of Plant Industry, and was continued at that station through 1926. Early in the spring of 1927 the breeding animals in this series of experiments were transferred to the United States Range Livestock Experiment Station at Miles City, Mont., where the remaining experiments were carried on. This station is maintained by the Bureau of Animal Industry in co-operation with the Montana Agricultural Experiment Station at Bozeman.

#### ANIMALS USED

In 1925, the first year of the experiments, the breeding animals consisted of 10 Duroc-Jersey sows (fig. 1) and 11 gilts of the same breed. In most years 9 or 10 dams in each of these groups were used. The gilts that produced the 1925 pig crop were all from gilts which farrowed their first litter when about 12 months of age. The sows that produced the 1925 pigs had each farrowed one or more litters previous to 1925. Care was exercised to have the gilts and sows of as nearly the same type as possible. The gilts used in 1925 were produced from five matings. In subsequent selections of gilts to continue this group, an effort was made to maintain the five lines of descent. The breeding animals selected were classed as the large type but were not extreme in this respect. The sows had a greater tendency to fatten than many animals of the large type usually have.

All the pigs used in the experiments were farrowed in the spring. In 1925 and 1926 a few of the dams in the mature-sow lot were used to produce fall pigs for other experimental purposes. After 1926 all the breeding animals were maintained on a one-litter-a-year basis. Each year the gilts were mated with a boar of about the same age. The mature sows were mated with a boar 20 months or more of age (fig. 2). Since the gilts selected to produce the pigs in 1925 had themselves been produced by gilts, the 1932 spring pigs from gilts whose dams were gilts represented the ninth successive generation of pigs from immature dams.

As a result of the transfer of the breeding animals from the Belle Fourche station to the Miles City station in the spring of 1927,

there were necessarily changes in the environmental conditions as well as in the kinds of feed used. Beginning with the 1928 spring pig crop, the same plan, with only minor changes, was followed until the end of 1932. The group of mature sows and the group of succes-



FIGURE 1.—Type of sows used in the mature-sow group.



FIGURE 2.—One of the boars mated with the mature sows.

sive generations of gilts from gilts were continued as in the preceding 3 years, and an intermediate group of dams was added to the experiment. This group consisted of gilts whose dams were in the mature-sow group. Since one of the principal objects of these experiments

was to determine whether the vitality or efficiency of successive generations of immature dams is reduced, it was decided to have available, for comparison, a group of gilts in which the influence of successive generations of immature dams was not present.

For the 5-year period 1928-32 the systems of breeding and management of the three groups were as follows:

Group 1 consisted of mature sows 2 years old or more, each of which had previously produced one or more litters of pigs. In making necessary replacements from year to year in this group, care was exercised to add only sows which had been produced by mature breeding animals. Each year the sows in this group were mated to a boar approximately 20 months of age. The boar used to sire the pigs produced in groups 2 and 3 was used the following year to sire the pigs produced by the mature sows in group 1.

Group 2 consisted each year of gilts selected from pigs produced by the mature sows in group 1. The gilts in this lot were mated to the same boar as were the gilts in group 3.

Group 3 consisted each year of gilts which were the progeny of the successive generations of gilts originally begun at the Belle Fourche station in 1925. The gilts in this group were selected each year so as to continue the five lines of descent present in the foundation gilts of this group. To make the selections and yet maintain these lines, it was necessary to retain some gilts that would not have been kept had the selections been made without reference to the ancestry of the individuals. An unrelated boar pig was obtained each fall to mate with the gilts in groups 2 and 3 and was used the following year to mate with the sows in group 1.

Thus, as the experiment progressed from year to year the three groups of pigs produced each year became more closely related on the side of the dam.

Previous to 1928, when the plan for the experiments was revised to include three groups each year, there was considerable variation from year to year in the feeds used, the methods of management followed, and the environmental conditions where the experiments were conducted. During 1925 and 1926, when the experiments were carried on at the Belle Fourche station, considerable use was made of sugar beets in the rations. These are an unusual feed for hogs, very bulky, highly carbonaceous, and rather laxative. The nature of this feed was greatly different from that used in later experiments. Consequently, except for production data obtained from 1925 to 1927 and shown in table 1, this circular reports only the experimental data obtained from 1928 to 1932, when the more uniform procedure was followed. Limiting the results to those obtained in 1928-32, for the most part, makes the data obtained in the later years increasingly significant owing to the accumulated effects of the breeding practices used.

#### EXPERIMENTAL PROCEDURE

During any given year of the 1928-32 experiments, the three groups of breeding animals were maintained under similar conditions throughout the gestation and suckling periods, and when the pigs were weaned those from each group were kept together and carried to a marketable weight under similar conditions of feed and management. The

following information regarding the experimental procedure applies only to the 1928-32 experiments.

#### BREEDING SEASON

Each year at the beginning of the breeding season the breeding animals were placed in their respective groups, in which the sows or gilts farrowing litters remained until their pigs were weaned. A 3-day initial weight was taken at the beginning of the breeding season, and feed-consumption and weight data were recorded in 28-day periods from this time. The breeding season continued for 6 weeks, after which sows known to be not with pig were removed from the herd at the close of one of the 28-day feeding periods. Since only spring litters were produced in this series of tests it was considered impractical to keep over until another year any sow or gilt that did not farrow

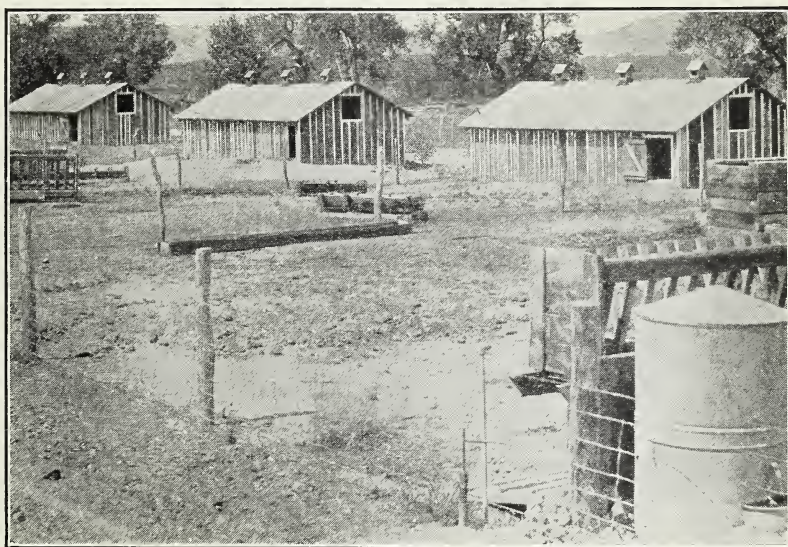


FIGURE 3.—Winter quarters for sows and gilts at the United States Range Livestock Experiment Station, Miles City, Mont., showing shelters and feeding and watering equipment.

a litter. The gilts in groups 2 and 3 which were nonbreeders sold as good-quality butcher hogs; therefore there was practically no economic loss from these animals. However, mature sows which failed to produce a litter represented a considerable economic loss.

As an insurance against losses caused by iodine deficiency, which is more or less common in the locality where the experiments were conducted, the breeding animals were fed about 50 grains of potassium iodide per animal for the first 10 weeks of the breeding season. No trouble was experienced with hairless pigs, nor were there any indications of thyroid derangement.

#### GESTATION PERIOD

During the gestation period each group of sows or gilts was confined in a lot 60 by 150 feet, in which was a well-constructed frame building 14 by 28 feet for shelter (fig. 3). Water was available at all times in containers which prevented the water from freezing.

The basic grain ration fed from 1928 to 1931, inclusive, was ground barley. In 1932 a change was made to ground wheat, which was fed throughout the 1932 experiment. In addition to the grain ration, the sows and gilts were fed one-fourth pound of digester tankage per head daily and had access at all times to minerals and alfalfa hay in a rack.

The individual sows were weighed and moved into the farrowing house approximately 5 days before they were due to farrow. At this time the tankage and alfalfa hay were replaced by one-half pound of linseed meal per head daily. This change in the ration seemed to be beneficial.

The barley fed was No. 2 Brewing, the wheat No. 2 Dark Northern, and the digester tankage was of the 60-percent protein grade. The alfalfa hay was grown at the station and was of a good grade, green and leafy, and usually second cutting. The mineral mixture was composed of one-third salt, one-third steamed bonemeal, and one-third monocalcium phosphate.

#### SUCKLING PERIOD

The litters in these experiments were farrowed in a community farrowing house containing 13 individual pens. Since about 50 litters were farrowed at the Miles City station each spring, it was necessary to move the newly farrowed pigs to outside quarters when they were only a few days old. However, a sufficient number of small individual houses were available to house the litters until they were 2 or 3 weeks old. At this time the sows and litters were gradually regrouped in conformity with the gestation-period allotment. About 10 days after farrowing each litter was on a full ration, and when the sows and litters were grouped into their respective lots they were self-fed a ration of ground barley or wheat, tankage, and minerals until the pigs were weaned. About May 10 of each year, or when the pigs were slightly more than 1 month old, the sows and litters were placed on non-irrigated native grass pasture which usually contained some volunteer sweetclover and in some cases rye which had been sown the previous fall. The supply of succulent forage for this period of the experiments was usually limited. The pigs were immunized against hog cholera by the simultaneous method, previous to weaning. The male pigs were castrated when approximately 4 weeks of age. An effort was made to control parasitic infection by preventive measures, but no medicinal treatment was used.

#### FATTENING PERIOD

Each year the pigs in the three groups were weaned at the same time, and the fattening experiment began immediately. A few pigs were removed from the experiment at weaning time, but approximately 90 percent of those weaned in each group were used in the fattening experiment. After weaning the groups were self-fed the same concentrates on irrigated alfalfa pasture (fig. 4). These concentrates consisted of ground barley, tankage, and minerals in 1928-31, and ground wheat, tankage, and minerals in 1932.

Owing to the variation in the numbers of pigs produced by the three groups of dams, it was impossible to stock the pastures with a uniform number of pigs per acre, but all groups had access to an abundance of pasture except for the last 2 or 3 weeks of the feeding trials, when the pool fall weather retarded the growth of the alfalfa. This condition,

however, affected all the lots uniformly. Alternate plots of alfalfa were available for each experimental group so that one plot could be irrigated and a new growth of alfalfa begun while the other plot was being pastured. An early first cutting of hay was removed from the pasture plots each year before the fattening experiments were begun. The rate of stocking was approximately 20 pigs per acre for the combined plots.

Drinking water was available at all times. There was a sunshade in each pasture plot, but there were no buildings to provide shelter during stormy or inclement weather. The pigs were weighed individually on 3 successive days at the beginning and close of the fattening trials and at 28-day intervals throughout the test. When the pigs were weighed at the end of these intervals, any feed remaining in the self-feeders was weighed also and the quantity deducted from that fed to obtain the actual feed consumption.

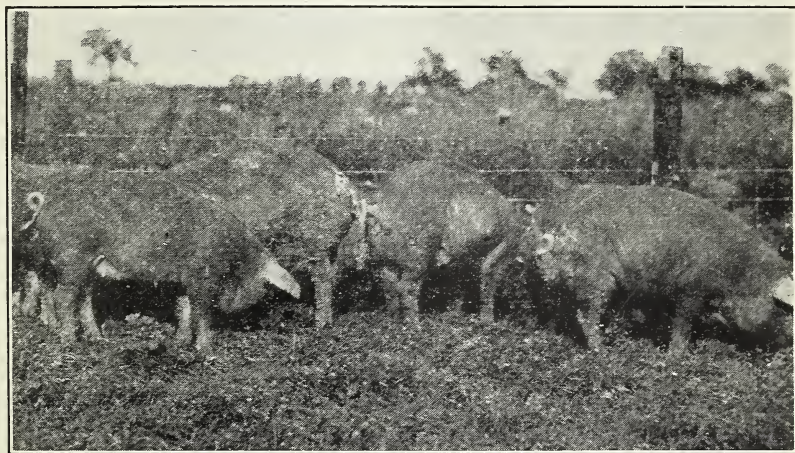


FIGURE 4.—Duroc-Jersey pigs on alfalfa pasture at the United States Range Livestock Experiment Station.

#### MARKETING AND SLAUGHTER

The fattening period continued each year until the hogs reached an average weight of slightly more than 200 pounds, when they were marketed. The animals were shipped to a midwestern market and disposed of to a packing company. The journey to market usually required 5 days, and the hogs were unloaded twice en route for feed and rest. They were sold by groups corresponding to their experimental lots, and the hogs in each group were usually sorted into classes by the packer buyer for more accurate appraisals.

Arrangements were made each year with the packing company to obtain dressing percentages and make such carcass studies as seemed desirable. In 1931 and 1932 the live hogs and hog carcasses were individually graded by committees of three graders, using charts developed by the Department of Agriculture.

## EXPERIMENTAL RESULTS

## FARROWING AND WEANING DATA

Table 1 shows the production data for the groups of dams used in the experiments from 1925 to 1932, inclusive. Because of the variations already mentioned in the experimental procedure during the first 3 years, no definite deductions can be made from the data during this period. The average results for the 3 years, under the experimental conditions which prevailed, show that the mature sows were superior to the gilts from gilts in number of pigs per litter and the birth weights of the pigs. The former dams also gave birth to a slightly smaller percentage of stillborn pigs. Their litters had a higher weaning weight per pig and made larger daily gains during the suckling period. The gilts from gilts, on the other hand, made a much better showing in the percentage of pigs born alive that were weaned and marketed.

The three groups of dams in these experiments were consistent producers. In the 5-year period 1928-32, more than 90 percent of the dams in each group farrowed litters. Of 135 animals in the three groups during this period, 127 farrowed litters, 6 failed to conceive, 1 gilt aborted, and 1 sow died at farrowing. Of 42 mature dams which were bred, 92.9 percent conceived at the first mating and 4.8 percent at the second mating. Of 46 gilts from sows, 84.8 percent conceived at the first mating, 10.9 percent at the second, and 2.2 percent at the third. Of 47 gilts from gilts, 74.5 percent conceived at the first mating and 17.0 percent at the second mating. The mature sows, therefore, led the other groups in the percentage of dams conceiving at the first mating. This was to be expected as the mature sows had demonstrated their breeding ability before being used in these experiments. Although there was a larger percentage of nonbreeding dams in group 3 (gilts from gilts) than in any of the other groups, the fact that approximately 92 percent of the gilts in this group farrowed litters indicates that they were reasonably sure breeders. In 3 of the 5 years all the gilts in group 3 farrowed litters, and three of the four nonbreeders were in the group in 1932.

In 2 of the 5 years the mature sows farrowed the largest litters of the three groups, and only in 1932 did the successive generation of gilts from gilts farrow larger litters than the other two groups of breeding animals. For the 5-year period the litters farrowed by the mature sows averaged 1.1 pigs per litter more than the litters farrowed by the gilts from sows and 2.1 pigs per litter more than the litters from the gilts from gilts. The poorer showing made by the group 3 gilts was due to small litters in 1929 and 1930. However, the fact that the litters farrowed by these groups in 1931 and 1932 were above the average in size for the 5-year period indicates that the poor showing made in 1929 and 1930 was not due to any deterioration in the productive ability of these gilts. The data presented in table 1 on the weights of the pigs at weaning and at time of marketing appear to substantiate this statement.

The differences in the birth weights of the pigs farrowed by the three groups of dams during the 5-year period are very small. Although there is a tendency for mature sows to farrow the heavier pigs, there is also a decided tendency for pigs in larger litters to be lighter at

TABLE 1.—Comparative production data for the groups of mature and immature sows, 1925-32  
PRELIMINARY EXPERIMENTS

| Year                      | Group of dams    | Group No. | Sows bred | Litters farrowed | Pigs per litter | Average birth weight of pigs | Stillborn pigs per litter | Percentage of pigs born alive that were raised until— |            | Pigs weaned per litter farrowed | Average weaning weight corrected to 70 days of age | Average daily gain during suckling | Pigs marketed per litter | Weight of hogs marketed per litter adjusted to 190 days <sup>1</sup> |
|---------------------------|------------------|-----------|-----------|------------------|-----------------|------------------------------|---------------------------|-------------------------------------------------------|------------|---------------------------------|----------------------------------------------------|------------------------------------|--------------------------|----------------------------------------------------------------------|
|                           |                  |           |           |                  |                 |                              |                           | Weaning                                               | Market-ing |                                 |                                                    |                                    |                          |                                                                      |
|                           |                  |           | Number    | Number           | Number          | Pounds                       | Number                    | Percent                                               | Percent    | Number                          | Pounds                                             | Pound                              | Number                   | Pounds                                                               |
| 1925                      | Mature sows      | 1         | 10        | 8                | 8.1             | 2.74                         | 0.9                       | 58.6                                                  | 56.9       | 4.3                             | 46.1                                               | 0.59                               | 4.1                      | —                                                                    |
|                           | Gilts from gilts | 3         | 11        | 9                | 9.5             | 2.12                         | 1.4                       | 87.8                                                  | 85.6       | 7.2                             | 32.3                                               | —                                  | 7.0                      | —                                                                    |
| 1926                      | Mature sows      | 1         | 10        | 9                | 12.3            | 2.81                         | .6                        | 48.1                                                  | 45.3       | 5.7                             | 41.8                                               | .54                                | 5.3                      | —                                                                    |
|                           | Gilts from gilts | 3         | 10        | 10               | 8.6             | 2.93                         | .4                        | 89.0                                                  | 84.4       | 7.3                             | 34.9                                               | —                                  | 7.0                      | —                                                                    |
| 1927                      | Mature sows      | 1         | 5         | 4                | 12.3            | 2.52                         | .5                        | 51.1                                                  | 51.1       | 6.0                             | 51.1                                               | .64                                | 6.0                      | —                                                                    |
|                           | Gilts from gilts | 3         | 10        | 7                | 10.0            | 2.62                         | .4                        | 59.7                                                  | 56.7       | 5.7                             | 39.1                                               | —                                  | 5.4                      | —                                                                    |
| Total or weighted average | Mature sows      | 1         | 25        | 21               | 10.7            | 2.73                         | .7                        | 51.7                                                  | 49.8       | 5.2                             | 45.2                                               | .58                                | 5.0                      | —                                                                    |
|                           | Gilts from gilts | 3         | 31        | 28               | 9.3             | 2.52                         | .8                        | 80.3                                                  | 77.4       | 6.9                             | 34.7                                               | .45                                | 6.6                      | —                                                                    |

## COMPARATIVE EXPERIMENTS

| Year                      | Group of dams    | Group No. | Sows bred | Litters farrowed | Pigs per litter | Average birth weight of pigs | Stillborn pigs per litter | Percentage of pigs born alive that were raised until— |            | Pigs weaned per litter farrowed | Average weaning weight corrected to 70 days of age | Average daily gain during suckling | Pigs marketed per litter | Weight of hogs marketed per litter adjusted to 190 days <sup>1</sup> |
|---------------------------|------------------|-----------|-----------|------------------|-----------------|------------------------------|---------------------------|-------------------------------------------------------|------------|---------------------------------|----------------------------------------------------|------------------------------------|--------------------------|----------------------------------------------------------------------|
|                           |                  |           |           |                  |                 |                              |                           | Weaning                                               | Market-ing |                                 |                                                    |                                    |                          |                                                                      |
|                           |                  |           | Number    | Number           | Number          | Pounds                       | Number                    | Percent                                               | Percent    | Number                          | Pounds                                             | Pound                              | Number                   | Pounds                                                               |
| 1928                      | Mature sows      | 1         | 8         | 7                | 11.1            | 2.35                         | 1.4                       | 69.1                                                  | 69.1       | 6.7                             | 42.4                                               | 0.59                               | 6.7                      | 1,423                                                                |
|                           | Gilts from sows  | 2         | 10        | 9                | 7.0             | 2.76                         | .4                        | 84.7                                                  | 83.1       | 5.6                             | 39.0                                               | .55                                | 5.4                      | 1,183                                                                |
|                           | Gilts from gilts | 3         | 10        | 10               | 8.4             | 2.59                         | .4                        | 91.3                                                  | 90.0       | 7.3                             | 31.8                                               | .43                                | 7.2                      | 1,390                                                                |
| 1929                      | Mature sows      | 1         | 7         | 7                | 9.6             | 2.42                         | 1.6                       | 55.4                                                  | 50.0       | 4.4                             | 49.1                                               | .67                                | 4.0                      | 915                                                                  |
|                           | Gilts from sows  | 2         | 9         | 9                | 9.7             | 2.51                         | .6                        | 81.7                                                  | 81.7       | 7.4                             | 24.0                                               | .46                                | 7.4                      | 1,389                                                                |
|                           | Gilts from gilts | 3         | 10        | 10               | 7.2             | 2.91                         | .3                        | 80.9                                                  | 79.4       | 5.5                             | 41.9                                               | .57                                | 5.4                      | 1,126                                                                |
| 1930                      | Mature sows      | 1         | 10        | 9                | 10.3            | 2.71                         | 1.0                       | 82.5                                                  | 83.5       | 7.8                             | 40.4                                               | .57                                | 7.7                      | 1,386                                                                |
|                           | Gilts from sows  | 2         | 9         | 9                | 6.7             | 2.60                         | .8                        | 73.5                                                  | 73.5       | 8.4                             | 35.2                                               | .48                                | 8.4                      | 1,625                                                                |
|                           | Gilts from gilts | 3         | 9         | 9                | 10.8            | 2.79                         | 1.1                       | 73.9                                                  | 73.9       | 7.3                             | 40.9                                               | .53                                | 7.3                      | 1,686                                                                |
| 1931                      | Mature sows      | 1         | 9         | 8                | 9.5             | 2.40                         | .1                        | 66.7                                                  | 62.7       | 6.3                             | 35.9                                               | .69                                | 5.9                      | 1,262                                                                |
|                           | Gilts from sows  | 2         | 9         | 8                | 9.4             | 2.26                         | .5                        | 63.6                                                  | 60.7       | 6.1                             | 40.0                                               | .51                                | 5.8                      | 1,321                                                                |
|                           | Gilts from gilts | 3         | 9         | 8                | 7.9             | 2.63                         | .3                        | 90.3                                                  | 88.5       | 5.0                             | 53.2                                               | .73                                | 4.6                      | 1,110                                                                |
| 1932                      | Mature sows      | 1         | 8         | 8                | 7.3             | 2.73                         | .4                        | 77.6                                                  | 73.5       | 6.2                             | 45.5                                               | .63                                | 5.9                      | 1,353                                                                |
|                           | Gilts from sows  | 2         | 9         | 9                | 8.3             | 2.53                         | .2                        | 71.1                                                  | 68.2       | 6.4                             | 44.4                                               | .64                                | 6.2                      | 1,420                                                                |
|                           | Gilts from gilts | 3         | 9         | 6                | 10.0            | 2.65                         | 1.0                       | 81.0                                                  | 79.1       | 6.8                             | 46.6                                               | .52                                | 6.6                      | 1,322                                                                |
| Total or weighted average | Mature sows      | 1         | 24        | 40               | 8.9             | 2.58                         | .5                        | 79.1                                                  | 77.6       | 5.9                             | 38.7                                               | .51                                | 5.8                      | 1,366                                                                |
|                           | Gilts from sows  | 2         | 46        | 44               | 8.9             | 2.62                         | .6                        | 79.4                                                  | 77.6       | 5.9                             | 38.7                                               | .51                                | 5.8                      | 1,200                                                                |
|                           | Gilts from gilts | 3         | 47        | 43               | 7.9             | 2.62                         | .6                        | 79.4                                                  | 77.6       | 5.9                             | 38.7                                               | .51                                | 5.8                      | 1,200                                                                |

<sup>1</sup> Data for 1 sow that died during the gestation period were not included.

<sup>2</sup> Data not available for the first 3 years.

birth, so that the differences in individual birth weight of the pigs from mature sows and gilts were slight.

Table 1 presents data showing percentages of the pigs farrowed alive which were raised to weaning age or marketing weight. In this respect both groups of gilts were decidedly superior to the mature sows. Similar results were obtained from 1925 to 1927. One reason for the difference was that the mature sows killed a higher percentage of their pigs by overlying them. The highest percentage of pigs raised to weaning and marketing was in 1928 by the gilts from gilts, 91.3 percent of the pigs being weaned and 90 percent marketed. The number of pigs weaned per litter by the sows was intermediate between the numbers weaned by the two groups of gilts.

The weight of the litters at 190 days of age is more dependent on the number of pigs in the litter than on any other factor, and in this



FIGURE 5.—Eighth generation of gilts from gilts at alfalfa-hay rack, winter of 1932.

respect as well as in number of pigs marketed per litter the mature sows rank between the two groups of gilts. The heaviest litters, when adjusted to 190 days of age at time of marketing, were from the mature sows in 1931, when they averaged 1,686 pounds. For the 5-year period the litters farrowed by the gilts from mature sows averaged 44 pounds heavier, at 190 days of age, than the litters from mature sows and were 106 pounds heavier than the litters from the successive generations of gilts. The litters from the group 3 gilts in 1932 were heavier than for any of the preceding years, thus rather clearly indicating that there had been no reduction in the vitality of the successive generations of immature dams (fig. 5).

The mature sows were undoubtedly better sucklers than the gilts. This is indicated by the fact that in each of the 5 years the pigs suckled by mature sows made more rapid gains than either group of pigs suckled by gilts. Since the litters farrowed by the three groups of dams were weaned at the same time, there was a variation in the ages of the pigs at weaning. However, as shown in table 1, the weights of each pig were corrected to 70 days of age.

For the duration of this series of experiments there was a trend toward an increase in the number of pigs weaned per litter by the mature sows which was not present in the gilt lots. This trend is undoubtedly due to the careful selection of high-producing sows to be used for replacements in the herd. It has been shown that although there is little if any correlation between the size of litters of dams and their offspring there is a large correlation between the sizes of subsequent litters from the same dam. In the mature-sow group it was possible to select as replacements dams which had indicated ability as producers of large, thrifty litters.

Owing to differences in the breeding dates and in the number of dams rebred in the different groups, there was some variation in the number of days the animals were in the breeding herd before they farrowed litters. To eliminate, so far as possible, the effect of these variations, it seemed advisable to make some adjustments in the gestation-period data, as presented in table 2. As the table shows, the initial weight of each dam was the weight on the day she was last bred, and the weight before farrowing was taken when she was moved into the farrowing house 109 days after mating. Thus, the gain in weight per dam and the average daily gain are for a 109-day period.

TABLE 2.—Average feed consumption and gains of the groups of dams during first 109 days of the gestation periods,<sup>1</sup> 1928-32

| Item                                                              | Group 1,<br>mature sows | Group 2,<br>gilts from<br>sows | Group 3,<br>gilts from<br>gilts |
|-------------------------------------------------------------------|-------------------------|--------------------------------|---------------------------------|
| Dams farrowing.....number.....                                    | 40                      | 44                             | 43                              |
| Average weight per dam when last bred.....pounds.....             | 440.4                   | 264.3                          | 257.2                           |
| Average weight per dam before farrowing <sup>2</sup> .....do..... | 589.2                   | 408.1                          | 405.1                           |
| Average gain per dam.....do.....                                  | 148.8                   | 143.8                          | 147.9                           |
| Average daily gain per dam.....do.....                            | 1.36                    | 1.32                           | 1.36                            |
| Average daily ration per dam:                                     |                         |                                |                                 |
| Grain <sup>3</sup> .....do.....                                   | 6.51                    | 5.43                           | 5.44                            |
| Tankage.....do.....                                               | .24                     | .24                            | .24                             |
| Minerals.....do.....                                              | .05                     | .05                            | .04                             |
| Linseed meal.....do.....                                          | .02                     | .02                            | .01                             |
| Alfalfa hay.....do.....                                           | 2.17                    | 1.09                           | .95                             |
| Feed consumed per 100 pounds of gain:                             |                         |                                |                                 |
| Grain <sup>3</sup> .....do.....                                   | 477.3                   | 411.7                          | 400.9                           |
| Tankage.....do.....                                               | 17.6                    | 18.2                           | 17.8                            |
| Minerals.....do.....                                              | 3.4                     | 3.6                            | 3.3                             |
| Linseed meal.....do.....                                          | 1.2                     | 1.2                            | 1.1                             |
| Total concentrates.....do.....                                    | 499.5                   | 434.7                          | 423.1                           |
| Alfalfa hay.....do.....                                           | 159.0                   | 82.8                           | 70.4                            |
| Feed consumed per live pig farrowed for full gestation period:    |                         |                                |                                 |
| Grain <sup>3</sup> .....pounds.....                               | 83.7                    | 74.1                           | 83.3                            |
| Tankage.....do.....                                               | 3.1                     | 3.3                            | 3.7                             |
| Minerals.....do.....                                              | .6                      | .6                             | .7                              |
| Linseed meal.....do.....                                          | .2                      | .2                             | .2                              |
| Total concentrates.....do.....                                    | 87.6                    | 78.2                           | 87.9                            |
| Alfalfa hay.....do.....                                           | 27.9                    | 14.9                           | 14.6                            |

<sup>1</sup> Except for the data on feed consumed per live pig farrowed, which were for the full gestation period.

<sup>2</sup> 109 days after last mating.

<sup>3</sup> Ground barley for first 4 years and ground wheat in 1932.

Table 2 shows that the mature sows and the gilts made practically the same average gains in weight during the gestation period. The mature sows were about 180 pounds heavier than the gilts, both at mating and when moved into the farrowing house 109 days later. The sows, however, consumed a much larger quantity of feed during the gestation period than did either group of gilts. The former ate slightly more than 2 pounds of alfalfa hay per day, which was twice

the quantity consumed by the gilts. The grain ration for the sows was about 1 pound more than for the gilts. The total feed (concentrates plus roughage) consumed per sow during the gestation period was 32 percent greater than that consumed per gilt in group 2, and 35 percent more than per gilt in group 3. However, since the mature sows farrowed a larger number of pigs per litter than the gilts, as shown in table 1, the feed consumed from the time the dams were last bred until the birth of the pigs was only slightly greater per live pig farrowed for the sows than for the gilts.

The gilts in groups 2 and 3 were approximately 1 year of age when they farrowed their litters. The ages of two mature sows used in group 1 in 1928 and again in 1929 were unknown. Of the remaining 36 sows in this group during the 5-year period, 1 farrowed a litter at about 5 years of age, 3 were 4 years old, 1 was 3½ years of age, 13 were 3-year-old sows, 1 was 2½ years old, and 17 were 2-year-old sows. The average age of the sows in group 1 at farrowing was approximately 2 years 7½ months.

The most noticeable difference in feed consumption for the suckling period, as shown in table 3, is the large ration of the mature sows and their litters as compared with that of the two groups of gilts and their litters. The gilts from gilts and their litters ate 5 pounds less grain daily per dam and litter than did the mature sows and their litters. All the litters were on a full ration from the time the pigs were 10 days old until they were weaned. Although the differences in the feed consumed per 100 pounds of pigs weaned were not large, the two groups of gilts were more economical producers in this respect than were the mature sows. The larger daily feed consumption of the mature sows and their litters resulted in a greater feed consumption per pig weaned but, as shown in table 1, the pigs weaned in group 1 were much heavier than those in the other two groups. Consequently, the differences in economy of production from a weight basis are not great. Both groups of gilts and their litters consumed less grain but more protein supplement per 100 pounds of pigs weaned than did the mature sows.

TABLE 3.—Weaning data and feed consumption of the groups of dams and litters during the suckling periods, 1928-32

| Item                                                            | Group 1,<br>mature sows | Group 2,<br>gilts from<br>sows | Group 3,<br>gilts from<br>gilts |
|-----------------------------------------------------------------|-------------------------|--------------------------------|---------------------------------|
| Sows weaning litters.....number.....                            | 1 38                    | 44                             | 2 41                            |
| Average pigs weaned per litter.....do.....                      | 6.5                     | 6.8                            | 6.2                             |
| Average weight of pigs weaned at 70 days of age.....pounds..... | 46.6                    | 37.6                           | 38.7                            |
| Average ration per sow and litter:                              |                         |                                |                                 |
| Grain.....do.....                                               | 16.7                    | 13.3                           | 11.7                            |
| Tankage.....do.....                                             | .7                      | .8                             | .7                              |
| Feed consumed per pig weaned at 70 days of age:                 |                         |                                |                                 |
| Grain.....do.....                                               | 178.0                   | 137.2                          | 134.3                           |
| Tankage.....do.....                                             | 7.3                     | 8.2                            | 8.4                             |
| Minerals.....do.....                                            | .4                      | .4                             | .4                              |
| Total.....do.....                                               | 185.7                   | 145.8                          | 143.1                           |
| Feed consumed per 100 pounds of pigs weaned:                    |                         |                                |                                 |
| Grain.....do.....                                               | 374.1                   | 353.5                          | 347.9                           |
| Tankage.....do.....                                             | 15.3                    | 21.2                           | 21.8                            |
| Minerals.....do.....                                            | .9                      | 1.0                            | 1.0                             |
| Total.....do.....                                               | 390.3                   | 375.7                          | 370.7                           |

<sup>1</sup> Data for 1 sow which lost all her pigs and 1 sow which died when her litter was 14 days old were eliminated. Data for 6 orphan pigs from the sow that died and which were raised to a marketable weight were also eliminated.

<sup>2</sup> Data for 2 gilts which lost all their pigs were eliminated.

The feed-consumption data for the periods from the time the dams were bred until the litters were weaned are presented in table 4. Two methods were used to show the comparative feed economy for the three groups. In the first method the entire feed consumption for the gestation and suckling periods was charged to the weanling pigs with no credit given to the increase in weight of the dams during this time. In the second method the increase in weight of the dams was added to the weight of the weanling pigs, and the economy of feed utilization was based on the total increase in weight of both dams and pigs. During the suckling period the gilts lost decidedly more weight than did the mature sows. The average loss in weight of the latter animals during this period was only 5.8 pounds, or a little more than 1 percent of their weight. The gilts in group 2 lost 23.4 pounds, on the average, which was more than 6 percent of their weight after farrowing. The greatest loss in weight during the suckling period was by the gilts in group 3. These dams lost an average of 32.3 pounds, which was nearly 9 percent of their weight after farrowing. The loss in weight of the mature sows at farrowing was approximately twice the weight of the pigs farrowed, whereas the gilts lost approximately one and three-fourths as much as the weight of the litters farrowed.

TABLE 4.—*Feed requirements for the production of weanling pigs by the various groups of dams during the combined gestation and suckling periods, 1928-32*

| Item                                                                              | Group 1,<br>mature sows | Group 2,<br>gilts from<br>sows | Group 3,<br>gilts from<br>gilts |
|-----------------------------------------------------------------------------------|-------------------------|--------------------------------|---------------------------------|
| Litters farrowed.....number..                                                     | 40                      | 44                             | 43                              |
| Litters weaned.....do.....                                                        | 38                      | 44                             | 41                              |
| Average weight of dams when bred.....pounds..                                     | 440.4                   | 264.3                          | 237.2                           |
| Average weight of dams at weaning.....do.....                                     | 526.7                   | 341.3                          | 334.1                           |
| Average gain in weight per dam.....do.....                                        | 86.3                    | 77.0                           | 76.9                            |
| Feed consumed by dams and litters per 100 pounds of pigs weaned:                  |                         |                                |                                 |
| Grain.....pounds..                                                                | 611.7                   | 577.7                          | 627.4                           |
| Tankage.....do.....                                                               | 24.1                    | 31.1                           | 34.2                            |
| Linseed meal.....do.....                                                          | .6                      | .7                             | .8                              |
| Minerals.....do.....                                                              | 2.6                     | 2.9                            | 3.3                             |
| Total concentrates.....do.....                                                    | 639.0                   | 612.4                          | 665.7                           |
| Alfalfa hay.....do.....                                                           | 79.1                    | 45.1                           | 49.0                            |
| Feed consumed by dams and litters per 100 pounds of gain of sows and pigs weaned: |                         |                                |                                 |
| Grain.....pounds..                                                                | 511.8                   | 452.2                          | 477.1                           |
| Tankage.....do.....                                                               | 20.1                    | 24.4                           | 26.0                            |
| Linseed meal.....do.....                                                          | .5                      | .6                             | .6                              |
| Minerals.....do.....                                                              | 2.1                     | 2.3                            | 2.5                             |
| Total concentrates.....do.....                                                    | 534.5                   | 479.5                          | 506.2                           |
| Alfalfa hay.....do.....                                                           | 66.2                    | 35.4                           | 37.3                            |

For the period from breeding until the litters were weaned, the mature sows gained about 10 pounds more per sow than did either lot of gilts. Since the gilts were growing during this period, the sows were in much better condition when the pigs were weaned than were the gilts. In some instances the gilts suckling large litters became greatly emaciated and lost as much as one-third of their weight during a 70-day suckling period.

## FATTENING DATA

Table 5 shows the gains in weight and feed consumption, during the fattening periods, of the progeny from the different groups of dams. The rate of gain of the three groups was fairly uniform, with the greatest variation among those produced by mature dams. On the average, for the 5-year period, the differences in the rate of gain for the three groups are negligible. The weaning weights of the pigs from mature sows were higher than those of either group of pigs from gilts, and these increased weights were carried through until the close of the fattening period when the animals had become hogs weighing 200 pounds or more. The average final weight of the hogs from the sows was thus a little more than that of the hogs from either group of gilts.

TABLE 5.—Gains in weight and feed consumption, during the fattening period, of progeny from the different groups of dams

| Year    | Group of dams    | Group No. | Progeny on test | Length of test 1 | Average initial weight | Average final weight | Average daily gain | Average age | Weight per day of age | Feed consumption per 100 pounds of gain in weight |          |           |       |
|---------|------------------|-----------|-----------------|------------------|------------------------|----------------------|--------------------|-------------|-----------------------|---------------------------------------------------|----------|-----------|-------|
|         |                  |           |                 |                  |                        |                      |                    |             |                       | Grain                                             | Tank-age | Min-erals | Total |
|         |                  |           | Number          | Days             | Lbs.                   | Lbs.                 | Lbs.               | Days        | Lbs.                  | Lbs.                                              | Lbs.     | Lbs.      | Lbs.  |
| 1928    | Mature sows      | 1         | 46              | 119              | 47.3                   | 221.8                | 1.47               | 195.1       | 1.14                  | 424.2                                             | 19.0     | 0.9       | 444.1 |
|         | Gilts from sows  | 2         | 49              | 119              | 39.9                   | 215.0                | 1.47               | 187.6       | 1.15                  | 412.7                                             | 16.3     | .6        | 429.6 |
|         | Gilts from gilts | 3         | 72              | 119              | 34.7                   | 199.2                | 1.38               | 193.0       | 1.03                  | 384.4                                             | 13.5     | .5        | 398.4 |
| 1929    | Mature sows      | 1         | 27              | 126              | 46.3                   | 227.2                | 1.44               | 188.8       | 1.20                  | 398.9                                             | 8.5      | 1.4       | 408.8 |
|         | Gilts from sows  | 2         | 64              | 126              | 37.5                   | 207.3                | 1.35               | 201.7       | 1.03                  | 375.2                                             | 13.7     | .9        | 389.8 |
|         | Gilts from gilts | 3         | 53              | 126              | 44.2                   | 222.5                | 1.42               | 197.5       | 1.13                  | 374.7                                             | 17.6     | .9        | 393.2 |
| 1930    | Mature sows      | 1         | 59              | 117              | 50.4                   | 199.0                | 1.27               | 201.2       | .99                   | 460.3                                             | 15.2     | .9        | 476.4 |
|         | Gilts from sows  | 2         | 54              | 115              | 46.1                   | 205.0                | 1.38               | 195.6       | 1.05                  | 413.8                                             | 11.0     | .8        | 425.6 |
|         | Gilts from gilts | 3         | 31              | 117              | 49.3                   | 215.2                | 1.42               | 194.3       | 1.11                  | 421.7                                             | 9.2      | 1.3       | 432.2 |
| 1931    | Mature sows      | 1         | 63              | 112              | 52.9                   | 220.0                | 1.49               | 184.9       | 1.19                  | 376.5                                             | 9.2      | 1.0       | 386.7 |
|         | Gilts from sows  | 2         | 40              | 112              | 42.3                   | 213.7                | 1.53               | 184.5       | 1.15                  | 345.2                                             | 12.3     | 1.3       | 358.8 |
|         | Gilts from gilts | 3         | 36              | 112              | 38.7                   | 203.2                | 1.47               | 175.9       | 1.16                  | 365.8                                             | 12.7     | 1.3       | 379.8 |
| 1932    | Mature sows      | 1         | 29              | 112              | 54.1                   | 228.8                | 1.56               | 184.4       | 1.24                  | 351.0                                             | 2.8      | 3.4       | 357.2 |
|         | Gilts from sows  | 2         | 42              | 112              | 48.7                   | 217.8                | 1.51               | 185.8       | 1.17                  | 344.6                                             | 10.1     | 3.0       | 357.7 |
|         | Gilts from gilts | 3         | 34              | 112              | 32.5                   | 183.1                | 1.34               | 166.4       | 1.10                  | 318.5                                             | 7.2      | 3.1       | 328.8 |
| Average | Mature sows      | 1         | 224             | 116              | 50.5                   | 216.8                | 1.43               | 191.7       | 1.13                  | 406.0                                             | 11.7     | 1.3       | 419.0 |
|         | Gilts from sows  | 2         | 249             | 118              | 42.5                   | 211.1                | 1.43               | 192.2       | 1.10                  | 380.7                                             | 12.8     | 1.2       | 394.7 |
|         | Gilts from gilts | 3         | 226             | 118              | 39.2                   | 205.1                | 1.40               | 187.5       | 1.09                  | 375.1                                             | 13.0     | 1.2       | 389.3 |

<sup>1</sup> In 1930 the heavier pigs in each group were marketed on Oct. 15 and the remaining pigs on Nov. 20. The periods given for this year represent the average feeding period for each group.

There were necessarily some differences in the ages of the hogs in the three groups, and as the feeding trials were closed at the same time some of the animals were marketed at a younger age than the others. To overcome this difference in age, the final weights of the hogs at the close of the feeding trials were divided by their age, the results being shown in table 5 as "weight per day of age." The hogs in the gilt-from-gilt group were slightly younger, and although there was a difference of 6 pounds in the average weights of the hogs in the gilt groups, this difference apparently was almost entirely due to the differences in ages of the hogs, as shown by the table. The heaviest weight per day of age, at time of marketing, was that of the hogs from mature sows in 1932. These animals weighed 1.24 pounds per day of age. The only year in which any group of hogs weighed less than 1 pound per day of age when they were marketed was in 1930, when the hogs from mature sows weighed only 0.99 pound per day of age.

The hogs from mature sows made consistently less economical gains than the hogs from gilts. In each of the 5 years the groups of hogs from the gilts consumed less total feed per unit of gain than did those from mature sows. The latter required 6 percent more feed than the hogs from the gilts farrowed by mature sows and 8 percent more than the hogs from the gilts farrowed by gilts. In 1932, when wheat was fed in place of barley, all groups required less feed per unit of gain than in any of the previous 4 years. However, there was a decided increase in the mineral consumption in each lot during this year. The hogs produced by mature sows and by gilts from gilts made the least economical gains in 1930, and those produced by gilts from mature sows made the least economical gains in 1928 and 1930. In the latter year the feed requirements of all groups were about 11 percent greater than for the 5-year average.

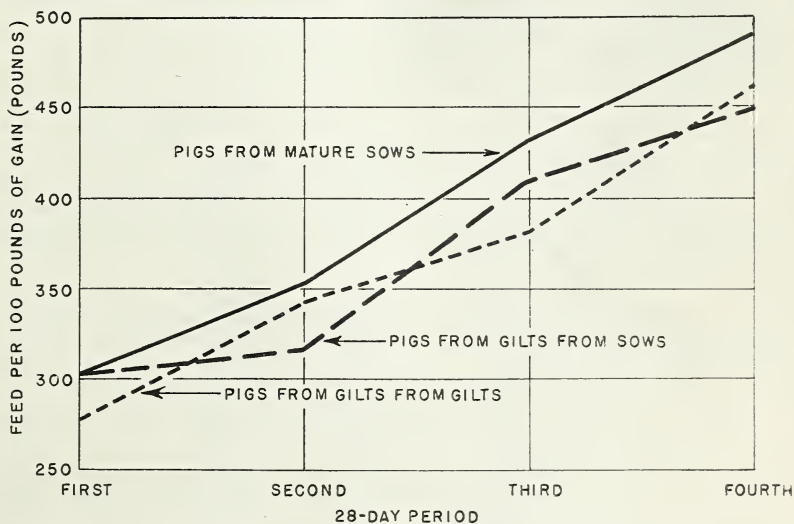


FIGURE 6.—Feed consumed per 100 pounds of gain in weight by 28-day periods, during fattening trials.

In figure 6 the average feed requirements per unit of gain for the 5 years are shown for each of the four 28-day periods. In some cases the hogs were continued on the experimental fattening ration for a short time after the close of the fourth 28-day period, but owing to the variation in its length this finishing period was not included in figure 6.

There was a rapidly increasing feed requirement per unit of gain as the hogs became heavier, amounting to approximately 50 percent from the first to the fourth 28-day periods. The trend of this requirement was similar for each of the three groups. The figure shows that the hogs from gilts farrowed by gilts made the most economical gains in the first period and again in the third period, the hogs from gilts farrowed by mature sows made the most economical gains in the second and fourth periods, but throughout the four periods the hogs from mature sows made less economical gains than those from either of the other two groups.

In table 6 the feed-consumption data for each group of breeding animals for the gestation and suckling periods are combined with those

of the fattening trials to show the total feed required to produce 100 pounds of marketable hogs at a final weight of a little more than 200 pounds each. As has been shown in tables 4 and 5 the feed required for 100 pounds of pigs at weaning time was very much greater than the feed required to produce 100 pounds of gain in weight after weaning. As a result of this situation, the feed requirement per 100 pounds of hogs marketed is, in most cases, approximately 10 percent greater than that required to produce 100 pounds of increase in weight during the fattening trials with weaned pigs.

As shown in table 6 the feed requirements for the two groups of pigs produced by gilts, from the beginning of the gestation period until marketing were nearly the same. It required about 38 pounds more feed per 100 pounds of finished hogs farrowed by mature sows than for those from gilts. Therefore, hogs from gilts marketed at approximately 225 pounds of weight required about 85 pounds less feed per hog marketed than those from mature sows.

The variation from year to year in the feed consumption per 100 pounds of hogs marketed was greatest in the group produced by the gilts from gilts. In 1930, as shown in table 1, only 4.4 pigs per litter were marketed from this group so that the feed requirement was abnormally high, amounting to about 525 pounds of feed per 100 pounds of hogs marketed. In 1932, for the progeny from the same group of dams the feed requirement was about 390 pounds per 100 pounds of hogs marketed, which was the most economical production in these tests.

TABLE 6.—Total feed consumption, per 100 pounds of marketable hogs, by the dams during gestation, by the dams and litters during the suckling period, and by the weaned pigs during fattening

| Year    | Group of dams    | Group No. | Feed consumed per 100 pounds of weight |         |              |          |                    |             | Feed cost per 100 pounds marketable hogs <sup>1</sup> |
|---------|------------------|-----------|----------------------------------------|---------|--------------|----------|--------------------|-------------|-------------------------------------------------------|
|         |                  |           | Grain                                  | Tankage | Linseed meal | Minerals | Total concentrates | Alfalfa hay |                                                       |
|         |                  |           | Pounds                                 | Pounds  | Pounds       | Pounds   | Pounds             | Pounds      | Dollars                                               |
| 1928    | Mature sows      | 1         | 471.0                                  | 20.7    | 0.1          | 1.1      | 492.9              | 14.6        | 8.90                                                  |
|         | Gilts from sows  | 2         | 453.1                                  | 20.8    | .2           | .9       | 477.0              | 7.0         | 8.61                                                  |
|         | Gilts from gilts | 3         | 415.9                                  | 17.1    | .1           | .8       | 433.9              | 7.5         | 7.77                                                  |
| 1929    | Mature sows      | 1         | 478.5                                  | 12.1    | .1           | 1.5      | 492.2              | 25.0        | 8.64                                                  |
|         | Gilts from sows  | 2         | 412.9                                  | 17.0    | .1           | .9       | 430.9              | 9.4         | 7.73                                                  |
|         | Gilts from gilts | 3         | 426.0                                  | 21.5    | .1           | 1.0      | 448.6              | 11.5        | 8.18                                                  |
| 1930    | Mature sows      | 1         | 483.0                                  | 18.0    | .2           | 1.0      | 502.2              | 15.2        | 8.97                                                  |
|         | Gilts from sows  | 2         | 439.6                                  | 15.6    | .2           | 1.4      | 456.8              | 9.3         | 8.12                                                  |
|         | Gilts from gilts | 3         | 493.0                                  | 16.7    | .3           | 2.1      | 512.1              | 10.9        | 9.08                                                  |
| 1931    | Mature sows      | 1         | 415.9                                  | 12.3    | .1           | 1.1      | 429.4              | 16.7        | 7.52                                                  |
|         | Gilts from sows  | 2         | 403.5                                  | 15.2    | .1           | 1.4      | 420.2              | 7.7         | 7.49                                                  |
|         | Gilts from gilts | 3         | 416.1                                  | 15.7    | .1           | 1.6      | 433.5              | 6.8         | 7.72                                                  |
| 1932    | Mature sows      | 1         | 426.6                                  | 6.3     | .2           | 4.3      | 437.4              | 25.0        | 7.59                                                  |
|         | Gilts from sows  | 2         | 388.0                                  | 13.6    | .2           | 3.6      | 405.4              | 11.7        | 7.15                                                  |
|         | Gilts from gilts | 3         | 366.6                                  | 10.3    | .2           | 4.1      | 381.2              | 11.4        | 6.72                                                  |
| Average | Mature sows      | 1         | 453.1                                  | 14.7    | .1           | 1.6      | 469.5              | 18.1        | 8.33                                                  |
|         | Gilts from sows  | 2         | 421.1                                  | 16.6    | .1           | 1.5      | 439.3              | 9.0         | 7.86                                                  |
|         | Gilts from gilts | 3         | 423.0                                  | 17.0    | .1           | 1.6      | 441.7              | 9.4         | 7.91                                                  |

<sup>1</sup> At the following average prices per hundredweight for the 5-year period: Barley and wheat, \$1.65; tankage, \$5; linseed meal, \$5; and mineral mixture \$2.50; alfalfa hay at \$8 per ton.

The data presented in table 6 are based on the weight of marketable hogs produced, no credit being given for the gain in weight of the dams. Table 4 shows that each group of breeding animals increased in weight from the time the dams were bred until their litters were weaned.

The average increase in weight of the mature sows was 86 pounds, and of the gilts the corresponding increase was 77 pounds. If the increase in weight of the dams had been considered as marketable pork, the feed charge per 100 pounds of gain, from the beginning of the breeding season until their progeny was marketed, would have been reduced in each group by approximately 8 percent. However, from a financial standpoint, it seems advisable to disregard this increase in weight of the dams for the reason that as the breeding animals become older and heavier their market value per pound becomes less, resulting in little if any increase in the gross market value of the animals. Even though the increase in weight of the dams was credited as marketable pork, the feed cost per 100 pounds of increase in weight of the dams and pigs in group 1 would still be more than 40 cents per 100 pounds greater than that of the successive generations of gilts from gilts and their pigs (group 3).

The feed requirements for producing 100 pounds of marketable hogs are shown in figure 7 for the three periods of pork production.

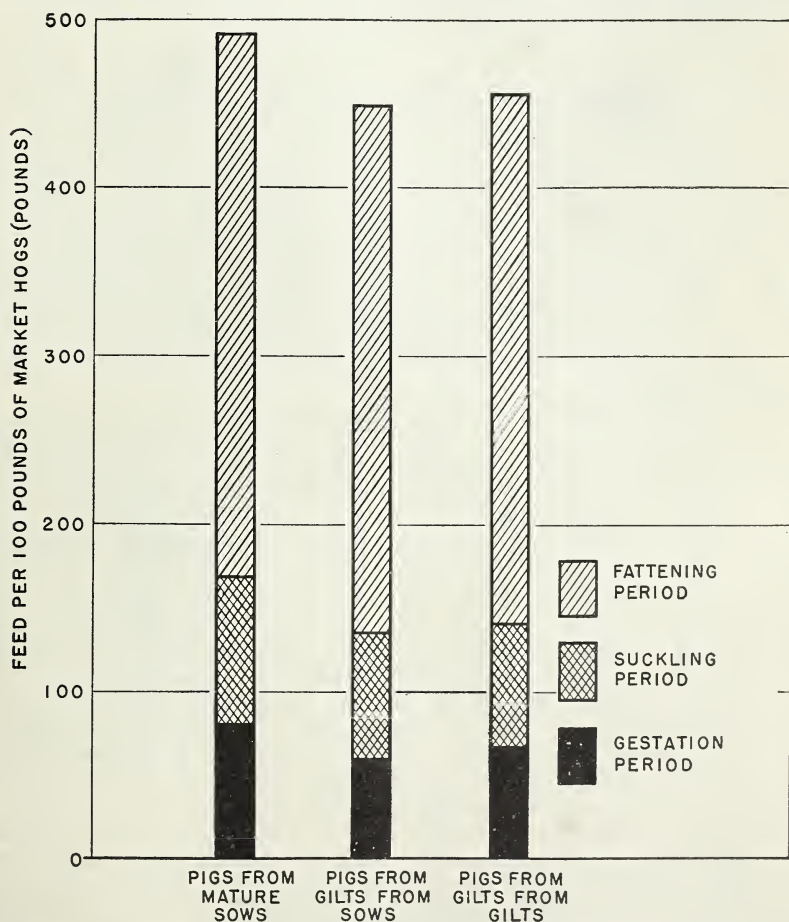


FIGURE 7.—Feed required to produce 100 pounds of market hogs apportioned to the gestation, suckling, and fattening periods.

In the mature-sow group, the feed consumed during the gestation period represented 15.6 percent of the total feed required to time of marketing, whereas in the group of gilts from sows the feed consumed during the gestation period was only 12.7 percent of the total. The group of gilts from gilts was intermediate between the other two groups, the feed consumption during gestation being 14.5 percent of the total. In the mature-sow group 34 percent of the total feed required was consumed during the gestation and suckling periods, whereas in each of the two groups of gilts the feed consumed previous to weaning was only 30 percent of the total.

These figures are applicable when 70 to 80 percent of the live pigs farrowed are raised to a marketable weight. When smaller percentages are raised the costs for the gestation and suckling periods would be much greater. The fact that there is a feed requirement of approximately 100 pounds per pig up to the time of birth signifies the economic importance of raising a large percentage of the pigs to a marketable weight. For each pig that is lost an increased feed charge must be borne by those remaining before any profit can be obtained.

As shown in table 1, the pigs produced by mature sows made decidedly more rapid gains during the suckling period than either of the other groups. For the 5-year period these pigs gained about 20 percent more rapidly than the pigs produced by either group of gilts. However, during the fattening period there was a gradual slowing up of the rate of gain of the progeny from mature sows as compared with the rates of gain of the other two groups, with the result that the difference in the final weights of the three groups was small. The average gain per hog by 14-day periods for the three groups is graphically shown in figure 8. These data were prepared from smoothed growth curves, in which all the weights obtained for the pigs from birth until the close of the fattening trials were taken into consideration.

The steady increase in the rate of gain as the pigs became older is also shown in figure 8. For the first 2 weeks after the pigs were farrowed the rate of gain was approximately one-third of a pound per day, whereas in the last 2 weeks of the feeding trials all the lots were increasing in weight at a rate of nearly 2 pounds per pig daily.

Owing to the long and tiresome journey to market the shrink en route was heavy. This was especially true in 1930 when a severe blizzard caused a delay of 24 hours in reaching the market and subjected the animals to severe exposure en route and at feeding stations. For the first 4 years, as shown by table 7, the progeny of the mature sows had the smallest percentage of shrink of the three groups, and for the first 4 years the progeny of the gilts from gilts had the largest percentage shrink. In 1932 the comparative shrinkage of the hogs in these two groups was reversed. The average shrink for the 5 years was about 2 percent less for the hogs in group 1 than for those in group 3, and 1 percent less in group 1 than in group 2.

The hogs from gilts from gilts sold at substantially lower prices than the others in 1928 and 1931. In 1929 both groups of hogs from gilts sold at higher prices than those from mature sows. However, the differences in selling price were not sufficiently large or consistent to indicate a marked advantage for the hogs of any one group. For the 5-year period the average selling price of the hogs from the suc-

cessive generations of gilts from gilts was 7 cents per 100 pounds less than the price received for the hogs from mature sows. The hogs in group 3, however, were 6 pounds lighter in weight than those in group 2 and averaged almost 5 days younger.

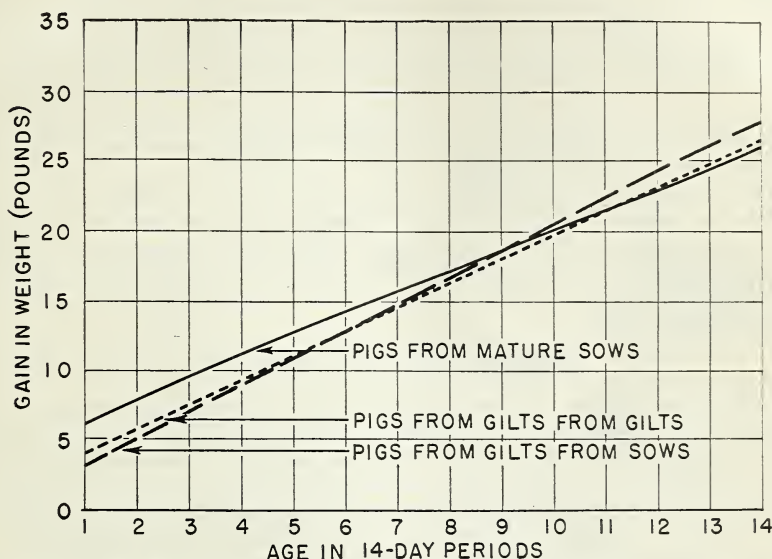


FIGURE 8.—Gain in weight, by 14-day periods from birth to market, of progeny from various groups of dams.

TABLE 7.—Shrinkage en route to market, selling price, and dressing percentage of the experimental hogs from the different groups of dams

| Year                | Group of dams         | Group No. | Marketing shrink per hog | Percentage shrink in marketing | Selling price per hundred-weight | Dressing percentage <sup>1</sup> |
|---------------------|-----------------------|-----------|--------------------------|--------------------------------|----------------------------------|----------------------------------|
|                     |                       |           | Pounds                   | Percent                        | Dollars                          | Percent                          |
| 1928.....           | Mature sows.....      | 1         | 11.6                     | 5.19                           | 9.30                             | 76.2                             |
|                     | Gilts from sows.....  | 2         | 13.5                     | 6.31                           | 9.25                             | 75.7                             |
|                     | Gilts from gilts..... | 3         | 14.3                     | 7.26                           | 9.15                             | 73.3                             |
| 1929.....           | Mature sows.....      | 1         | 7.4                      | 3.28                           | 10.10                            | 78.5                             |
|                     | Gilts from sows.....  | 2         | 7.9                      | 3.82                           | 10.25                            | 73.3                             |
|                     | Gilts from gilts..... | 3         | 11.0                     | 5.04                           | 10.25                            | 72.9                             |
| 1930.....           | Mature sows.....      | 1         | 8.6                      | 3.26                           | 8.47                             | 77.4                             |
|                     | Gilts from sows.....  | 2         | 17.3                     | 8.22                           | 8.49                             | 74.5                             |
|                     | Gilts from gilts..... | 3         | 20.7                     | 9.52                           | 8.49                             | 73.3                             |
| 1931.....           | Mature sows.....      | 1         | 8.2                      | 3.36                           | 4.50                             | 76.3                             |
|                     | Gilts from sows.....  | 2         | 12.6                     | 5.31                           | 4.50                             | 75.4                             |
|                     | Gilts from gilts..... | 3         | 11.8                     | 5.45                           | 4.25                             | 73.1                             |
| 1932.....           | Mature sows.....      | 1         | 18.6                     | 6.89                           | 3.37                             | 76.4                             |
|                     | Gilts from sows.....  | 2         | 14.1                     | 5.56                           | 3.34                             | 76.0                             |
|                     | Gilts from gilts..... | 3         | 11.4                     | 5.14                           | 3.33                             | 75.6                             |
| 5 year average..... | Mature sows.....      | 1         | 10.0                     | 4.31                           | 7.15                             | 76.8                             |
|                     | Gilts from sows.....  | 2         | 12.5                     | 5.63                           | 7.16                             | 74.9                             |
|                     | Gilts from gilts..... | 3         | 13.2                     | 6.23                           | 7.09                             | 73.6                             |

<sup>1</sup> Dressing percentage is based on individual shipping weights, and warm dressed weights with head on, leaf fat in, and ham facing not removed.

In each of the 5 years the progeny of the mature sows had the highest dressing percentage of any of the groups. The progeny of gilts from sows consistently "outdressed" that of the gilts from gilts. The hogs from mature sows weighed about 10 pounds more than those

from gilts from mature sows and 20 pounds more than those from gilts from gilts, and this would to some extent account for higher dressing percentages of the first two groups.

In 1931 and 1932 the hogs were graded by a committee of three, using a chart developed by the Department of Agriculture. The results of this grading indicated that the hogs in the gilt-from-gilt group were slightly less desirable than those in the other two groups but not enough to make any material difference in the selling price, as shown in table 7. The three groups graded "intermediate plus" in type, that is, intermediate tending toward the large type. The hogs farrowed by gilts from sows graded slightly larger in type than those in the other two groups.

The carcasses of the hogs in 1931 and 1932 were also graded by using the carcass-grading chart. The carcasses of the hogs in the mature-sow group graded somewhat higher than those in the other two groups, and those in the gilt-from-gilt group were lowest in grade. The carcasses showed a somewhat greater variation in grade than did the live hogs.

### SUMMARY AND CONCLUSIONS

Experiments were conducted from 1925 to 1932 to determine the comparative value of mature sows, gilts from sows, and gilts from gilts for the production of pork. The experiments were carried on at the United States Belle Fourche Field Station at Newell, S. Dak., and the United States Range Livestock Experiment Station, at Miles City, Mont. All the animals used were of Duroc-Jersey breeding.

The results of the experiments consistently showed that pigs can be raised to a marketable weight of approximately 225 pounds more economically when farrowed by gilts than when produced by mature sows. Gilts required less feed during the gestation period, and their pigs made more economical gains during the suckling and fattening periods. Pigs farrowed by gilts from mature sows were raised to a marketable weight at a feed cost of 47 cents per 100 pounds of live weight less than pigs produced by mature sows. Pigs from gilts from gilts were raised to a marketable weight at a feed cost of 42 cents per 100 pounds less than pigs produced by mature sows.

For the 5-year period 1928-32 the gilts from mature sows produced an average of 1,366 pounds of pigs per litter at 190 days of age, the mature sows produced 1,322 pounds per litter, and the gilts from gilts produced litters averaging only 1,260 pounds at 190 days of age.

Both groups of gilts showed a decided advantage over the mature sows in the percentage of pigs raised to weaning and marketing. The mature sows farrowed larger litters than the gilts, but the gilts from mature sows weaned more pigs per litter than did the mature sows.

The mature sows were undoubtedly better sucklers than the gilts as their pigs averaged, during the 5-year period, 9.0 and 7.9 pounds, respectively, more at weaning time than did the pigs produced by gilts in groups 2 and 3.

There was no material difference in the selling price of the three groups of pigs.

The gilts from mature sows were better producers of market hogs than the gilts from gilts. This may be due to the fact that in order to maintain the five lines of descent in the successive generations of gilts

it was necessary to keep some less desirable breeders than would otherwise have been retained. That there was no deterioration in the productive ability of the gilts from gilts is evidenced by the fact that in the last year of the test the gilts from gilts produced litters averaging 1,420 pounds at 190 days of age, which was the best record of this group for the 8 years of the test.

An advantage in the production of pigs from gilts is that those gilts which do not prove to be sure breeders can be disposed of while they will still sell as good butcher hogs.

Another advantage in using gilts is that a larger number of breeding animals than is desired to have farrow can be retained in the herd until it is ascertained which have conceived at the first mating and the others can be disposed of, thus insuring a pig crop of a more uniform age than when rebreeding is practiced.

Although this series of experiments was planned to eliminate so far as possible the influence of different sires on the experimental groups of pigs, it is possible that some of the variations encountered were due to differences in the breeding ability of the boars used. From the standpoint of the practical producer of market hogs, a decided element of risk is involved if only gilts and one boar are used to produce the market hogs and continue the breeding herds of dams. If the sire of the pigs should not prove to be a dependable breeding animal, the farmer would be unable to continue his pork-production activities without retaining for breeding purposes the progeny of the undesirable boar. This risk could be mitigated by using one or more proved sires, or by keeping a number of sows of proved breeding ability to produce a part of the breeding animals.

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